

Environmental Cost Element Structure

Training Manual

Revision 1

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by

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Acronyms and Abbreviations

A/PEG	Glycolate/Alkali Metal//Polyethylene Glycol
ACE Team	Applied Cost Engineering Team
BTEX	Benzene, Toluene, Ethyl benzene, and Xylene
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMS	Corrective Measure Study
COA	Code of Account
COE	Corps of Engineers
D&D	Decontamination and Decommissioning
DOE	Department of Energy
EC2	Environmental Cost Engineering Committee
ECAS	Environmental Cost Analysis System
ECES	Environmental Cost Element Structure
EM	Environmental Management
EPA	Environmental Protection Agency
ER	Environmental Restoration
FS	Feasibility Study
HQ	Headquarters
HTRW	Hazardous, Toxic, and Radioactive Waste
ICEG	Interagency Cost Estimating Group
LTSM	Long-Term Surveillance and Maintenance
MGD	Million Gallons per Day
O&M	Operations and Maintenance
OECD	Organization of Economic Cooperation and Development
OR	Oak Ridge
PA/SI	Preliminary Assessment/Site Investigation
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RL	Richland
SLTM	Surveillance and Long-Term Maintenance
SRS	Savannah River Site
UOM	Unit of Measure
WBS	Work Breakdown Structure
WM	Waste Management

I. INTRODUCTION

1.1 Objectives of User Manual

The objectives of this user manual are to inform Field and HQ program and project managers on the Environmental Cost Element Structure (ECES), why ECES was developed, its background, development, use and implementation. Additionally provide a reference material for program and project managers on how to use the ECES.

1.2 Background

As more environmental projects are initiated, especially projects that involve radioactivity, EM needs to start collecting project data so other sites can learn from experiences of similar past projects. Within the Field Offices & across the complex, current accounting & program management systems make it difficult to track or manage project cost & progress in a structured manner.

Within EM, there is no standardized method or guidance on what cost data should be collected, to what level of detail, or how to collect & maintain the data. For every document or report HQ requests and/or the Field develops, the information is difficult to reconcile and substantiate due to differing requirements, differing formats, and differing definitions. It is difficult to determine which information is accurate. As a result, information collected by Field Offices cannot be readily used by other sites. ECES was developed to provide a consistent and standardized method and “language” so that cost data available is more useful. ECES is a project management tool developed to minimize inconsistencies and to increase accountability and credibility.

1.3 What is ECES

The ECES is a comprehensive, hierarchical list of elements (tasks, items, or products) that may be required to accomplish an environmental project. ECES is comprised of activities conducted throughout the life-cycle of a program or project. The ECES has five levels of detail. Level 1 (uppermost tier) consists of life-cycle phases of an environmental program. Level 2 lists major work categories generally required to accomplish Level 1 elements, and Levels 3 through 5 provide more detailed breakdown of elements required to perform environmental work. The ECES includes a dictionary that specifies the scope of Level 1, 2 and 3 elements and indicates the metric typically used to capture cost information.

ECES was developed by the Interagency Environmental Cost Engineering Committee (EC)² whose members include DOE, Navy, Air Force, EPA, NASA, and Army Corps of Engineers. ECES is an enhancement to the existing Hazardous, Toxic, and Radioactive Waste Work Breakdown Structure (HTRW WBS). The HTRW WBS was updated to include different phases of an environmental project, to include new technologies, and to consolidate elements led to the development of ECES. In developing the ECES, (EC)² reviewed cost structure currently or previously in use at various Federal Agencies. Additionally, in developing the ECES, inputs and comments from the Navy, Air Force, EPA, Army Corps of Engineers, private industry and Association for Advancement of Cost Engineers International were included. Below is a listing of organizations and agencies involved in the development of ECES.

- COE Promise System WBS
- DOE Richland Operation Office, Environmental Restoration Project Suggested Studies and Design WBS Dictionary
- DOE Preferred Alternative Matrix (listing many technologies by media and contaminant application)
- EPA Remedial Investigation/Feasibility Study WBS
- EPA Remedial Design WBS
- EPA Remedial Design Oversight WBS
- EPA Remedial Action WBS
- EPA Remedial Action Oversight WBS
- Navy Studies and Design WBS
- Navy Technology List
- OECD Decommissioning Tasks Work Breakdown Structure

Because of changes to regulation, advancements in technologies, and changes to methods in performing environmental work, the EC² updates the ECES annually. Additionally, ECES has the .9X elements, which are included to provide some flexibility for adding user specific non-standard elements. ECES was developed for use as a Work Breakdown Structure or Code of Accounts.

1.4 What is a WBS and a COA?

Just as an organization hierarchically structures the people who perform work,

- Work Breakdown Structure (WBS) identifies and hierarchically structures activities to be performed in a project
- WBS segments projects into manageable units that can be used for planning, scheduling, and progress tracking, and
- WBS shows relationship of all elements in a project

Code of Account (COA) is a logical breakdown of a project into controllable elements for the purpose of cost collection, control, and reporting. COA is organized at lower detailed levels, which can be summarized to higher levels. COA is company and project specific.

Code of account also provides a common structure for cost collection in a database format, for use in developing future estimates for other similar activities or elements of cost that are unique to a specific site or business entity.

Although the numbering system for WBS and COA differs, a relationship and correlation exists between COA and WBS. Both WBS and COA are based on a system of increasing details as levels increase. A common purpose of both is to capture, track and control cost data in a project. ECES can be used as a WBS or COA by differing organizations.

II. HOW ECES IS ORGANIZED

ECES consists of comprehensive list of elements (tasks, items, or products) required to accomplish an environmental project. ECES is organized in hierarchical levels where the lower level detailed data are summarized to upper, higher levels. As the Level numbers increase, the more the details are included at each level.

2.1 *Explanation of the Levels*

Each level of the ECES is represented by a column, which is explained below.

- First column is Level 1 elements,
- Second column is Level 2 elements
- Third column is Level 3 elements
- The fourth column is Level 4 elements
- The fifth column is Level 5 elements
- The last column is the title of the ECES element

When writing the ECES number, each column is separated by a period. Figure 2.1 and Figure 2.2 shows how the ECES is written and identification of the columns. *For example:*

Figure 1.1 ECES Notation Format

<i>X.</i>	<i>xx.</i>	<i>xx.</i>	<i>xx</i>
Level 1	Level 2	Level 3	Level 4

Figure 2.2 – Identification of ECES Columns

Level 1	Level 2	Level 3	Level 4	Level 5
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	.	5	5	5
6
8
	34	90	90	90
	.9x	.9x	.9x	.9x
X.	xx.	xx.	xx.	xx

2.2 Level 1 – Phases

Level 1 is the uppermost tier (i.e., highest level), and includes seven cost categories. The categories consists of six phases (Phases 1 to 6) of an environmental project and a category for program or cross-cutting costs (Phase 8).

Level 1 elements are also called ***Phases***, and it represents the time frame as to when the project or activity is occurring. Level 2 and below represent what activities are being performed. In some instances there are some ECES element names which may be confused with the phases. For example “design” is an activity being performed and it is also used to represent the design phase such as “remedial design.”

The six generic life-cycle phases of Level 1 are:

- Phase 1: Assessment
- Phase 2: Studies

- Phase 3: Design
- Phase 4: Capital Construction
- Phase 5: Operations and Maintenance
- Phase 6: Surveillance and Long-Term Maintenance

Note: These are generic phase titles. Minor variations will exist between various regulatory and program requirements.

Level 1 Categories--These Level 1 categories are generic and apply to all environmental programs, including D&D. There are minor variations in definition from environmental restoration (ER) projects conducted under CERCLA, to projects under RCRA, or Waste Management (WM), and D&D. The similarity in the processes between various environmental projects/programs are shown next.

Phase 1 - Assessment - This phase includes the assessment and inspection of the site, and preparation of site inspection report. Specific activities comprise of the following.

- CERCLA Preliminary Investigation/Site Investigation (PA/SI)
- RCRA Facility Assessment (RFA)
- Preliminary Planning for waste and special material operations
- Pre-Decommissioning actions and planning

Phase 2 - Studies - This phase includes characterization, investigations, risk assessment, development and evaluation of treatment or remedial options, and treatability studies. For example, the CERCLA Remedial Investigation and Feasibility Studies (RI/FS), RCRA Facility Investigation/Corrective Measure Study (RFI/CMS), and Pre-conceptual Design/Research and Development are conducted in this phase.

Phase 3 - Design - This phases consists of engineering design and pre-construction activities of treatment or remediation alternatives. Examples of phase three activities include: CERCLA Remedial Design (RD), RCRA - Design portion of Corrective Measures, Waste Management facility design, and decommissioning and dismantlement design.

Phase 4 - Capital Construction phase - This phase includes construction of selected treatment or remediation alternatives. Phase 4 costs also include start-up and testing, but exclude all operations. Examples of items in this phase include: CERCLA Remedial Action (RA), RCRA Corrective Measure activities, Waste Management Facility construction, and D&D construction.

Phase 5 - Operations and Maintenance – This phase includes all operations and maintenance activities for the selected treatment or remediation alternatives. Phase 5 ends when clean-up or waste treatment goals are met. Examples of tasks for this phase include: CERCLA technology or remediation operations and maintenance; RCRA facility O&M; Waste Management facility O&M, and D&D O&M.

Phase 6 - Surveillance and Long-Term Maintenance - Phase 6 starts when operations have ceased or maintenance of a shut-down facility begins. Examples of phase 6 elements include: post closure surveillance and long term monitoring and on-site storage/disposal facility

surveillance and long term monitoring. It should be noted that in DOE EM, this phase is known as Long-Term Surveillance and Maintenance (LTSM) or Long-Term Stewardship (LTS).

Phase 8 - Cross-cutting - Level 1 element consists of Program Management, Support and Infrastructure, and those elements that are covered by the whole site or program and those costs that cannot be readily segregated

Reminder: Phase 8 is not an environmental life-cycle element. This Phase is meant to capture program wide or cross-cutting costs that cannot be readily separated into a specific project. This element is also used to indicate those cost that are expended over all the life-cycle phases of a project.

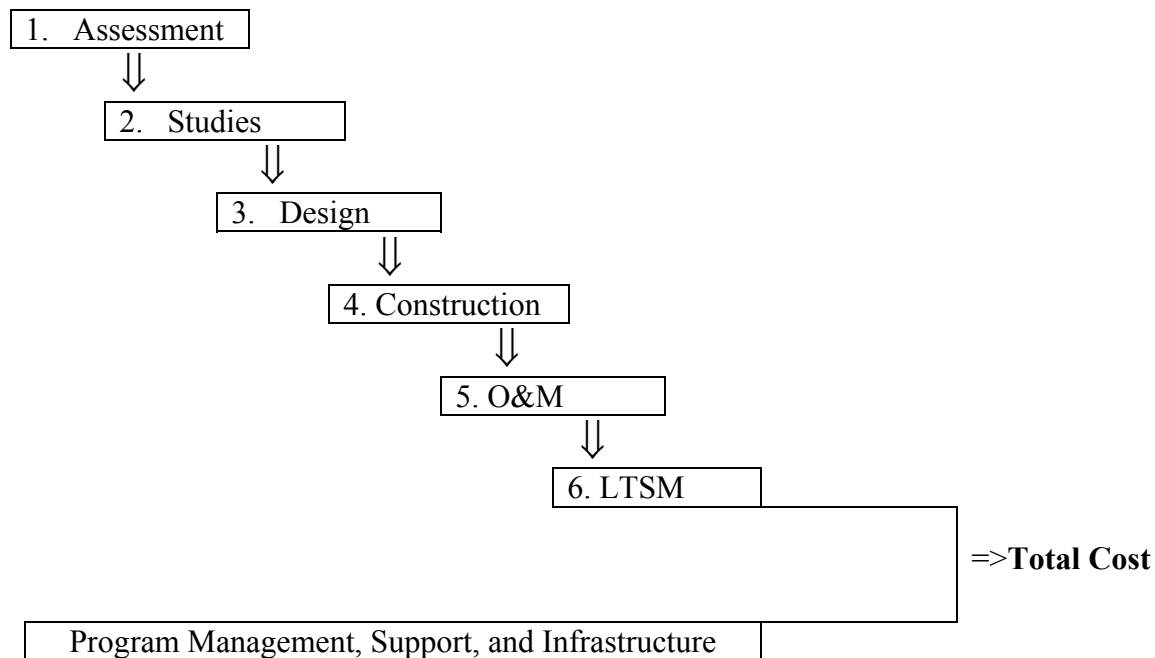
Figure 2.3 and 2.4 shows how the various Environmental Management projects can be applied for the Phases and the interaction of the life cycle phases.

Figure 2.3 – Application of Phases for Various Environmental Management Projects

ENVIRONMENTAL LIFE CYCLE PHASES

<i>Phase 1</i>	=>	Preliminary Site Investigation/Conceptual Phase
ER		Preliminary Assessment/Site Investigation - CERCLA RCRA Facility Assessment - RCRA
D&D		Pre-Decommissioning Actions
WM		Preliminary Planning - Waste/Special Materials Operations
<i>Phase 2</i>	=>	Site Investigation/Studies, R&D
ER		Remedial Investigation/Feasibility Study – CERCLA RCRA Facility Investigation/Corrective Measures Study - RCRA
D&D		Facility Shutdown/Decommissioning and R&D
WM		Pre-conceptual Design and R&D
<i>Phase 3</i>	=>	Remedial Design/Pre-construction
ER		Remedial Design – CERCLA Design Portion of Corrective Measures - RCRA
D&D		Design Decontamination & Dismantlement Project
WM		Design Waste Management Facilities
<i>Phase 4</i>	=>	Remedial Action/Construction
ER		Remedial Action – CERCLA Corrective Measures - RCRA
D&D		Construction/Start-up of Decontamination/Dismantlement
WM		Construction/Start-up of WM/Special Material Process Facility
<i>Phase 5</i>	=>	Operations & Maintenance Phase
ER		Operations & Maintenance
D&D		Decontamination & Dismantlement Operations
WM		Waste Management/Special Material Processing Operations
<i>Phase 6</i>	=>	Surveillance & Complex Wide/Post Remediation Long Term Monitoring
ER		Complex Wide/Post Remediation - Long Term Monitoring
D&D		Surveillance and Long Term Monitoring
WM		On-Site Disposal Surveillance and Long Term Monitoring

Figure 2.4--Interaction of Life-Cycle Phases



Level 1 Example

During a characterization and investigation effort, it was determined that some roads will need to be constructed to get to the site. What Level 1 phase would this fall into? How is it numerically represented?

Because the road construction occurred during **Studies** - characterization and investigation time period, this work will be recognized at Level 1- Phase 2.

Numerically, this is represented as **2.xx.xx.xx** (where xx represents element numbers).

2.3 ECES Sub-project Identifier

Between Level 1 and Level 2 of the ECES, there is an optional level category called the Sub-project Identifier. This is an optional field and not all projects may have a subproject.

Example

The project scope consists of construction of same type of RCRA C Caps (4.19.04) over three different ponds located in close proximity. To distinguish the caps for the three ponds the letters a, b, and c can be used with ECES such as 4.a.19.04, 4.b.19.04 and 4.c.19.04.

The optional sub-project identifier can be used to further clarify or specify two or more elements with the same ECES number and name.

The optional sub-project identifier uses the alphabets a to z. With the exception of letters “i” which has been reserved to indicate “interim action” and the letter “x” which indicates applicable to “all,” remainder of the characters are user defined.

For example, within a construction project there is RCRA C capping of two landfills of different sizes located close to each other. The letter “a” can be used to indicate the larger cap and the letter “b” can be defined for smaller cap. The letter “x” can be used to indicate A/E support acquired for the project covering both landfill caps.

Example number for A/E support is as follows:

4 . x . 02 . 07

- The number **4** represents Phase 4 of Level 1 ECES,
- The letter **x** represent Subproject identifier indicating application to “all,” and
- The set of number **.02.07** represents ECES number for A/E Support

2.4 *Level 2--Major Elements*

Level 2 represents major elements necessary to perform environmental work, and there are 34 elements in ECES. Whereas Level 1 represents timeframe of when the activity is occurring, Level 2 and lower levels show what tasks or activities are being conducted. Level 2 elements are identified in the second column or the second set of numbers in the ECES number system. Figure 2.5 shows the ECES Level 2 elements. This figure is included again in this section to show how to read the matrix.

How to read the matrix--in Figure 2.5 matrix, the first seven columns represent the Level 1 Phases or cost categories (note that Phase 7 is reserved), and the eighth column is the optional sub-project identifier. The ninth and tenth columns represent the Level 2 element numbers and their respective element titles. The numbers in the first seven columns represent those phases that may be applicable to Level 2 elements

Level 2 Example

The Level 2 element number 11, Treatment Plant/Facility has the numbers 4 and 5 marked in the Level 1 columns. This indicates that Phase 4 and Phase 5 are the most likely phases when Treatment Plant/Facility activity will be performed.

The applicable phase numbers marked are for guidance only. If applicable, users may use phases that are not marked.

Level 2 elements description and definitions have been developed by the (EC)² for the most likely phases.

Figure 2.5 ECES Level 2

Level 1							Sub Proj.	Level 2	
Ph 1	Ph 2	Ph 3	Ph 4	Ph 5	Ph 6	Cross Cut (8)		Major Work Elements	
1	2	3	4	5	6	8		.01	PROGRAM MANAGEMENT, SUPPORT & INFRASTRUCTURE (OPTIONAL)
1	2	3	4	5	6	8		.02	PROJECT MANAGEMENT & SUPPORT (Operable Unit/Solid Waste Management Unit)
1	2	3	4	5	6	8		.03	PREPARATION OF PLANS
1	2	3	4	5	6			.04	STUDIES/DESIGN & DOCUMENTATION
1	2	3	4	5	6	8		.05	SITE WORK
1	2	3	4	5	6	8		.06	SURVEILLANCE & MAINTENANCE
1	2	3	4	5	6			.07	INVESTIGATIONS & MONITORING/SAMPLE COLLECTION
1	2	3	4	5	6			.08	SAMPLE ANALYSIS
1	2	3	4	5	6			.09	SAMPLE MANAGEMENT/DATA VALIDATION/DATA EVALUATION
	2	3						.10	TREATABILITY/RESEARCH & DEVELOPMENT
			4	5				.11	TREATMENT PLANT FACILITY/PROCESS
			4	5	6			.12	STORAGE FACILITY/PROCESS
			4	5	6			.13	DISPOSAL FACILITY/PROCESS
			4					.14	ORDNANCE & EXPLOSIVES REMOVAL & DESTRUCTION (CWM is in X.11 & X.20-X.30)
			4					.15	DRUMS/TANKS/STRUCTURES/MISC. & REMOVAL
			4		6			.16	AIR POLLUTION/GAS COLLECTION & CONTROL
			4	5	6			.17	SURFACE WATER/SEDIMENTS CONTAINMENT, COLLECTION, OR CONTROL
			4	5	6			.18	GROUNDWATER CONTAINMENT, COLLECTION, OR CONTROL
			4	5	6			.19	SOLIDS/SOILS CONTAINMENT (e.g., CAPPING/BARRIER), COLLECTION, OR CONTROL
			4	5	6			.20	LIQUIDS WASTE/SLUDGES CONTAINMENT (e.g., UST/AST), COLLECTION OR CONTROL
			4	5				.21	IN SITU BIOLOGICAL TREATMENT
			4	5				.22	EX SITU BIOLOGICAL TREATMENT
			4	5				.23	IN SITU CHEMICAL TREATMENT
			4	5				.24	EX SITU CHEMICAL TREATMENT
			4	5	6			.25	IN SITU PHYSICAL TREATMENT
			4	5				.26	EX SITU PHYSICAL TREATMENT
			4	5				.27	IN SITU THERMAL TREATMENT
			4	5				.28	EX SITU THERMAL TREATMENT
			4	5				.29	IN SITU STABILIZATION/FIXATION/ENCAPSULATION
			4	5				.30	EX SITU STABILIZATION/FIXATION/ENCAPSULATION
			4	5				.31	FACILITY DECOMMISSIONING & DISMANTLEMENT
1	2	3	4	5				.32	MATERIAL HANDLING/TRANSPORTATION
1	2	3	4	5				.33	DISPOSAL
			4	5				.34	AIR EMISSION AND OFF-GAS TREATMENT
1	2	3	4	5	6	8		.9x	OTHER

2.5 *Level 3--Specific Elements*

Level 3 consists of more detailed elements required to perform the tasks at Level 2 of ECES, and Level 3 activities summarize to Level 2 elements. It is recommended by (EC)² that, at a minimum, users report to Level 3 of ECES.

2.6 *Level 4 and Below*

Use of Level 4 and more detailed elements are optional. Level 4 elements have been developed for some ECES components; however, Level 4 elements have **not** been developed for the environmental technologies (ECES elements x.21 to x.30). It is up to the individual agencies or organizations to develop or use Level 4 elements for environmental technologies as long as these elements roll-up to generic Level 4 technology definitions provided.

Phase 4: *Capital Construction*

- 4.xx.xx.01 Technology Transportation and Setup**--Includes transportation, delivery and setup of equipment necessary to construct and install a treatment technology. This element is also known as "Freight on Board."
- 4.xx.xx.02 Equipment and Components**--Includes process equipment and components; initial construction or installation of treatment technology components and materials; initial cost of technology parts and supplies, and other treatment costs inherent to that technology. For example, cost of off-gas treatment and components in an in-situ vitrification process.
- 4.xx.xx.03 Start-up and Testing**--Includes activities associated with start-up and testing of treatment technologies such as testing to demonstrate compliance, establishment of operating parameters, shakedown and training of O&M personnel. Startup and testing is considered complete when technology operations can be sustained within specified operational and quality standards.
- 4.xx.xx.9x Other**--This element is provided to allow the user to include an element for items or activities that are not addressed elsewhere

Phase 5: *Operations and Maintenance*

- 5.xx.xx.01: Performance Testing and Analysis**--Includes the monitoring, sampling, testing, and analyzing of costs to demonstrate the technology is performing as designed.
- 5.xx.xx.02: Operations**--Includes personnel and equipment necessary to operate the treatment technology.
- 5.xx.xx.03: Consumables**--Includes the materials and supplies used in operations of the treatment technology.
- 5.xx.xx.04: Utilities**--Includes the energy costs for operating the treatment technology.
- 5.xx.xx.05: Maintenance**--Includes the labor and materials necessary to perform preventive and corrective maintenance.
- 5.xx.xx.9x: Other**--This element is provided to allow the user to include an element for items or activities that are not addressed elsewhere

2.7 .9x--*Other elements*

ECES considers all possible tasks and non-standard elements by including the “Other” items at Level 2 and lower levels. The “Other” items are designated by the number .9x, and there are ten possible “Other” elements that can be designated for Level 2 and 3 elements.

III. EXAMPLE USES OF ECES

This section will show how to use ECES for various types of projects including: how to use the phases individually or for a life-cycle of a project; how to assign ECES numbers to the elements; and how to apply the ECES for various types of projects. Below lists steps for using ECES.

Step 1 - Identify the phase or phases when the work will be performed

Step 2 - Identify those activities that need to be or will be performed

Step 3 - Use the ECES as a checklist to identify additional activities

Step 4 - For the activities identified, assign the appropriate ECES number to each element

3.1 ER - D&D Project Example

This is an example on use of ECES for a D&D project. The description of the project is and the tables showing associated ECES numbers are displayed below.

Example

This project consists of D&D of Building 200 M-Wing Hot Cells at a DOE facility. All investigations, characterizations and design have been completed and thus will only consider Phase 4 and 6. Specifically, the work include:

- Decontaminating five cells in Building 200 M-Wing,
- Stripping the contaminated walls,
- Equipment disassembly (remotely),
- Removal of materials from cell and ship as waste (assume off-site), and
- Place cells in safe standby status.

Referring to the Steps again, Table 3.1 shows the ECES results.

Step 1 - Identify the phase or phases when the work will be performed

Step 2 - Identify those activities that need to be or will be performed

Step 3 - Use the ECES as a checklist to identify additional activities

Step 4 - For the activities identified, assign the appropriate ECES number to each element.

Table 3.1 – ECES for D&D Example

PHASE 4 WBS NUMBER	PHASE 6 WBS NUMBER	BUILDING 200 M-WING HOT CELLS D&D ACTIVITY DESCRIPTION
4.31	6.31	FACILITY DEACTIVATION, DECOMMISSIONING, & DISMANTLEMENT
4.31.08	6.31.08	Decontamination of Area and Equipment
4.31.08.06	6.31.08.06	Surface decontamination of floors (Stripping contaminated floors)
4.31.08.07	6.31.08.07	Surface decontamination of walls (Stripping contaminated floors)
4.31.08.10	6.31.08.14	Decontamination of area and equipment in hot cell (Decontaminate Five Hot Cells)
4.31.08.9x		Other
4.31.09		Removal of Contaminated Equipment and Materials
4.31.09.01		Cutting, sizing, and removal of equipment (Removal of contaminated equipment)
4.31.09.05		Cutting, sizing, and removal of structures/stacks (Removal of dissolver tank)
4.31.09.9x		Other
4.31.15		Removal of other Material and Equipment from Contaminated Structure
4.32.		MATERIAL HANDLING AND TRANSPORTATION
4.32.01		Waste Stream Handling and Packaging
4.32.01.01		Receiving and Inspection of waste (Inventory of Waste)
4.32.01.05		Remote handled packaging/overpacking (Repackaging waste)
4.32.11.06		D&D Facility Contaminated Equipment/Material Transportation
4.02.01		Project Management/Support/Administration
4.02.01.01		Project management
4.02.01.01.01		Develop cost estimates
4.02.01.01.10		Prepare reports/participate in reviews
4.02.01.02		Support Subcontracting Activities
4.02.03		Regulatory Interaction
4.02.03.05		Regulatory permitting
4.02.05		Post Design Support
4.02.06		Procurement and Warehousing of Equipment and Material
4.02.9x		Other
4.03.		PREPARATION OF PLANS
4.03.01		Work Plan
4.03.08		Transportation and Disposal Plan
4.03.15		Decommissioning Plan
4.05		SITE WORK
4.05.01		Mobilization
4.05.36		Demobilization
4.07	6.07	INVESTIGATION & MONITORING/SAMPLE COLLECTION
4.07.03	6.07.03	Site Contaminant Survey/Radiation Monitoring
4.07.08	6.07.08	Air Sampling
4.07.13.		Material/Waste Sampling
4.07.13.07		Waste Sampling- Solids
4.07.14	6.07.14	Contaminated Building/Structure Samples

3.2 *Disposal Cell Example*

The following is another example on application of ECES to a Disposal Cell.

Low Level Waste Disposal Cell Project is located at Oak Ridge, Tennessee. Use the ECES to include all activities conducted throughout the life-cycle of the project and the disposal cell.

This includes:

- Preliminary assessment
- Investigations and feasibility study
- Design of disposal cell
- Capital construction
- Operations and maintenance
- Post closure surveillance and long-term maintenance, and
- Program management and cross-cut activities

Referring to the Steps again,

Step 1- Identify the phase or phases when the work will be performed

Step 2 - Identify those activities that need to be or will be performed

Step 3 - Use the ECES as a checklist to identify additional activities

Step 4 - For the activities identified, assign the appropriate ECES number to each element.

Phase 1 Elements	Activity Description
1.02.01	Project Management/Support/Administration
1.02.01.01	Project Management
1.02.02	Community Relations
1.02.03	Regulatory Interaction
1.03	Preparation of Plans and Specifications
1.03.01	Work Plan
1.03.03	Sampling and Analysis Plan
1.03.07	Community Relations Plan
1.04	Studies/Design & Documentation
1.04.14	Value Engineering/Special Studies

Phase 2 Elements	Activity Description
2.02.01	Project Management/Support/Administration
2.02.01.01	Project Management
2.02.02	Community Relations
2.02.03	Regulatory Interaction
2.03	Preparation of Plans and Specifications
2.03.01	Work Plan
2.03.03	Sampling and Analysis Plan
2.03.07	Community Relations Plan
2.04.	Studies/Design & Documentation
2.04.02	Human Health Risk Analysis
2.04.03	Ecological Risk Analysis
2.04.04	Risk Assessment Documentation
2.04.05	Environmental Investigation Report
2.04.06	Develop Remedial Alternatives
2.04.08	Evaluate Alternatives
2.04.14	Value Engineering/Special Studies
2.07.04	Hydrogeological Investigation - Groundwater
2.07.06	Geophysical/Geotechnical Investigations
2.07.08	Air/Gas Sampling and Monitoring
2.07.09	Groundwater Sampling/ Monitoring
2.07.10	Surface Water Sampling and Monitoring
2.07.11	Soil/Sediment Sampling
2.08.	Sample Analysis
2.08.01	Air/Gas Sample Analysis
2.08.02	Groundwater Sample Analysis
2.08.03	Surface Water Sample Analysis
2.08.04	Soil/Sediment Sample Analysis
2.09	Sample Management/Data Validation/Data Evaluation
2.09.01	Prepare and Ship Environmental Sample
2.09.04	Provide Sample Management
2.09.07	Data Usability Evaluation/Field QA/QC
2.09.09	Modeling

Phase 3 Elements	Activity Description
3.02.01	Project Management/Support/Administration
3.02.01.01	Project Management
3.02.02	Community Relations
3.02.03	Regulatory Interaction
3.03	Preparation of Plans and Specifications
3.03.01	Work Plan
3.03.03	Sampling and Analysis Plan
3.03.07	Community Relations Plan
3.04.11	ER Project Design

Phase 4 Elements	Activity Description
4.02.01	Project Management/Support/Administration
4.02.01.01	Project Management
4.02.01.01.01	Develop Cost Estimates
4.02.01.05	Negotiation Support
4.02.02	Community Relations
4.02.03	Regulatory Interaction
4.02.03.01	Support Meeting with Regulators
4.02.03.03	Develop Interagency Agreement
4.02.03.05	Regulatory Permitting
4.02.06	Procurement and Warehousing of Equipment and Material
4.02.08	Construction Management
4.03.07	Community Relations Plan
4.03.08	Transportation and Disposal Plan
4.04.11	EM Project Design
4.05	Site Work
4.05.01	Mobilization
4.05.02	Cleanup/Landscaping/Revegetation
4.05.05	Excavation
4.05.06	Load and Haul
4.05.07	Borrow Pit/Haul Road
4.05.08	Access Road
4.05.14	Fencing
4.05.15	Parking Lots
4.05.26	Water Distribution
4.05.29	Communications
4.05.30	Lighting
4.05.31	Overhead Electrical Distribution
4.05.33	Sanitary Sewers
4.05.36	Demobilization
4.05.9x	Others
4.07	Investigations & Monitoring/Sample Collection
4.07.03	Site Contaminant Survey/Radiation Monitoring
4.07.08	Air/Gas Sampling and Monitoring
4.07.09	Groundwater Sampling/ Monitoring
4.07.10	Surface Water Sampling and Monitoring
4.08.	Sample Analysis
4.08.01	Air/Gas Sample Analysis
4.08.02	Groundwater Sample Analysis
4.08.03	Surface Water Sample Analysis
4.08.04	Soil/Sediment Sample Analysis
4.09.	Sample Management/Data Validation/Data Evaluation
4.09.01	Prepare and Ship Environmental Sample
4.09.04	Provide Sample Management
4.09.07	Data Usability Evaluation/Field QA/QC
4.11.05	Full Scale Waste Treatment Facility
4.12.02	Conventional Storage/Warehouses
4.13.02	Disposal Facility Front-End Low/Moderate Hazard
4.13.02.01	Receiving & Inspection
4.13.02.02	Assay
4.13.02.04	Waste Stream Sort/Separation
4.13.11	(or 13.10) Engineered Disposal Facility
4.31.08	Preparation and Decontamination for Area and Equipment
4.31.08.04	Decontamination and release of rad zone

Phase 5 Elements	Activity Description
5.02.01	Project Management/Support/Administration
5.02.02	Community Relations
5.02.03	Regulatory Interaction
5.02.03.01	Support Meeting with Regulators
5.02.03.03	Develop Interagency Agreement
5.02.03.05	Regulatory Permitting
5.02.06	Procurement and Warehousing of Equipment and Material
5.02.08	Contractor Construction Management
5.03.01	Work Plan
5.07	Investigations & Monitoring/Sample Collection
5.07.08	Air/Gas Sampling and Monitoring
5.07.09	Groundwater Sampling/ Monitoring
5.07.10	Surface Water Sampling and Monitoring
5.07.11	Soil/Sediment Sampling
5.07.13	Material/Waste Sampling
5.08.	Sample Analysis
5.08.01	Air/Gas Sample Analysis
5.08.02	Groundwater Sample Analysis
5.08.03	Surface Water Sample Analysis
5.08.04	Soil/Sediment Sample Analysis
5.08.07	Solid Waste Sample Analysis
5.09	Sample Management/Data Validation/Data Evaluation
5.09.01	Prepare and Ship Environmental Sample
5.09.04	Provide Sample Management
5.11.05	Full Scale Waste Treatment Facility
5.13.02	Disposal Facility Front-End Low/Moderate Hazard
5.13.02.01	Receiving & Inspection
5.13.02.02	Assay
5.13.02.03	Waste Stream Sort/Separation
5.13.04	Landfill
5.19.04	RCRA C Cap
5.31.08	Preparation and Decontamination of Area and Equipment
5.31.08.03	Protective Clothing and Breathing Apparatus

Phase 6 Elements	Activity Description
6.02.01	Project Management/Support/Administration
6.02.02	Community Relations
6.02.03	Regulatory Interaction
6.02.03.05	Regulatory Permitting
6.03.03	Sampling and Analysis Plan
6.03.07	Community Relations Plan
6.03.16	Post RA/D&D Monitoring Plan
6.05.02	Cleanup/Landscaping/Revegetation
6.05.08	Access Road
6.05.14	Fencing
6.05.15	Parking Lots
6.05.26	Water Distribution
6.05.29	Communications
6.05.30	Lighting
6.05.31	Overhead Electrical Distribution
6.05.33	Sanitary Sewers
6.07	Investigations & Monitoring/Sample Collection
6.07.08	Air/Gas Monitoring and Sampling
6.07.09	Groundwater Sampling/ Monitoring
6.07.10	Surface Water Sampling and Monitoring
6.07.11	Soil/Sediment Sampling
6.07.13	Material/Waste Sampling
6.08	Sample Analysis
6.08.01	Air/Gas Sample Analysis
6.08.02	Groundwater Sample Analysis
6.08.03	Surface Water Sample Analysis
6.08.04	Soil/Sediment Sample Analysis
6.08.07	Solid Material/Waste Sample Analysis
6.09	Sample Management/Data Validation/Data Evaluation
6.09.01	Prepare and Ship Environmental Sample
6.09.04	Provide Sample Management
6.13.04	Landfill
6.19.04	RCRA C Cap

Phase 8 Elements	Activity Description
8.01	Program Management, Support & Infrastructure (Optional)
8.01.02	Program Support
8.05	Site Work
8.05.14	Fencing
8.05.26	Water Distribution
8.05.29	Communications
8.05.30	Lighting
8.05.31	Above Ground Electrical Distribution
8.05.33	Sanitary Sewers
8.05.9x	Others

3.3 *Treatment Train Example*

Example

Contaminated site located in Mid-Atlantic region with sandy soil and shallow groundwater. Contaminants include BTEX, lead, and arsenic. Technologies to treat one MGD contaminated water include: pump and treat, coagulation/flocculation/precipitation, ion exchange, and ultraviolet photolysis. These technologies will be housed in a facility. O&M cost contributing to treatment train facility will be captured as part of the facility. O&M cost which can be clearly identified for specific technology will be captured as part of that technology. Facility will operate for 15 years, and natural attenuation to follow to treat trace amount of contaminants.

ECES CODE	ECES Title
1.02.01	Project Management/ Support/Administration
1.03.01	Work Plan (for Preliminary Assessment)
1.03.02	Chemical Data Acquisition Plan
1.03.03	Sampling and Analysis Plan
1.07.01	Site Reconnaissance
1.07.03	Site Contaminant Survey/Radiation Monitoring
1.07.04	Hydrogeological Investigation (Groundwater)
1.07.08	Air Monitoring and Sampling
1.07.09	Groundwater Monitoring and Sampling
1.07.11	Soil/Sediment Sampling
1.07.15	Monitoring Well
1.08.01	Air/Gas Sample Analysis
1.08.02	Groundwater Sample Analysis
1.08.04	Soil/Sediment Sample Analysis
1.09.01	Prepare and Ship Environmental Sample
1.09.08	Data Reduction, Tabulation, and Evaluation/Analysis

ECES CODE	ECES Title
2.02.01	Project Management/ Support/Administration
2.02.03	Regulatory Interaction
2.02.04	Institutional Controls
2.03.01	Work Plan (for RI/FS)
2.03.04	Health and Safety Plan
2.03.10	Risk Assessment Plan
2.03.11	Technical Goals and Objectives
2.04.02	Human Health Risk Assessment
2.04.05	Environmental Investigation Report
2.04.07	Screen Environmental Alternatives
2.04.10	Document Feasibility Study
2.04.16	Engineering Evaluation/Cost Analysis
2.07.15	Monitoring Well

ECES CODE	ECES Title
3.02.01	Project Management/ Support/Administration
3.02.03	Regulatory Interaction
3.04.11	Environmental Management Project Design
3.04.13	Facility Design
3.04.17	Record of Decision

ECES CODE	ECES Title
4.02.01	Project Management/ Support/Administration
4.02.03	Regulatory Interaction
4.03.01	Work Plan (for RA/Construction)
4.04.19	Post Construction Design Report
4.05.01	Mobilization
4.05.29	Communications
4.05.31	Overhead Electrical Distribution
4.05.36	Demobilization
4.07.09	Groundwater Sampling and Monitoring
4.08.02	Groundwater Sample Analysis
4.11.04	Treatment Train Facility (to house the technologies below)
4.18.01	Extraction Wells
4.24.07	Ion Exchange
4.24.13	Ultraviolet Photolysis
4.24.15	Coagulation/Flocculation/ Precipitation

ECES CODE	ECES Title
5.02.01	Project Management/ Support/Administration
5.02.03	Regulatory Interaction
5.07.08	Air Monitoring and Sampling
5.07.09	Groundwater Monitoring and Sampling (ongoing and not technology specific)
5.08.01	Air/Gas Sample Analysis (ongoing and not technology specific)
5.08.02	Groundwater Sample Analysis
5.11.04	Treatment Train Facility (O&M of)
5.24.07	Ion Exchange
5.24.13	Ultraviolet Photolysis
5.24.15	Coagulation/Flocculation/Precipitation

ECES CODE	ECES Title
6.02.01	Project Management/ Support/Administration
6.02.03	Regulatory Interaction
6.02.04	Institutional Controls
6.06.02	Outdoor Surveillance and Maintenance
6.07.08	Air Monitoring and Sampling
6.07.09	Groundwater Monitoring and Sampling (ongoing and not technology specific)
6.08.01	Air/Gas Sample Analysis (ongoing and not technology specific)
6.08.02	Groundwater Sample Analysis
6.26.06	Extraction Wells (after well P&A to ensure no contaminant pathway)

ECES CODE	ECES Title
8.01.01	Personnel Resources
8.01.02	Program Support
8.01.03	Program Infrastructure
8.01.04	Government Personnel Resources
8.01.05	Government-Program Support
8.01.06	Government-Program Infrastructure

IV. CAVEATS AND EXCEPTIONS TO RULE

As mentioned before, ECES evolved from HTRW WBS. In developing the ECES, (EC)² required compatibility to HTRW WBS, including the capability to crosswalk to both systems for those organizations are still using the HTRW WBS. As a result of this requirement, there are some elements in ECES that do not follow typical conventions. It is strongly encouraged that users of ECES read the dictionary and the definition of the tasks to become familiar with what costs or elements are included or not included. The dictionary will also explain what other elements can be used as substitutes or covers similar activities.

Caveat 1: Some elements defined in different phases are performing the same activities and, for some elements, different phases have different functions. For example:

- Element x.02.04, Institutional Controls, for Phases 1 to 4, the element is defined as the installation or construction of the task. During Phase 5 and 6, the activity is defined as the cost of maintaining and repairing the structures.
- However, for element such as X.17.01, the same activity is being performed for the different phases. The cost of element in each phase includes capital and O&M in one element.

Caveat 2: Because of the limitation in the numbers and characters that can be used, the level of detail between elements is not the same. For example:

- Element X.05.17, Site Work, Sidewalks is not of the same level of detail as X.24.01, Glycolate/Alkali Metal//Polyethylene Glycol (A/PEG)

Caveat 3: Users of ECES must carefully read the dictionary because there are some elements with very similar names. For example:

- Element X.25.04 is named Cryogenics (Frozen Soil Barrier) and X.26.42 is titled Cryogenics, but they are different technologies
- Element X.25.07 and X.25.08 have similar names also
- Because some technologies are applicable in both in-situ and ex-situ conditions, some elements have the same name and similar definitions (i.e., Skimming, SVE, Soil Flushing, and others).

Caveat 4: With some of the elements such as ISV, it can be called a thermal treatment or stabilization technology. There is a likely possibility of differences in interpretation among the ECES developers and users. Therefore it is highly recommended that the user search the list of technologies prior to creating a new technology under .9x.

In the appendix, there is an alphabetical listing of elements to assist the user quickly identify the technology and the ECES number.

Caveat 5: Some of the elements (x.21 to x.31) do not have details below Level 3. In some instances, it is difficult to determine if the component is part of a technology or should be captured by another element. Because it is not clearly identified, this can cause duplication or omission of costs. For example:

Element x.29.04, In situ Vitrification (ISV)-- Is the Granular Activated Carbon used to treat off-gas part of ISV cost or should it be captured separately?

(EC)² recommends that if the equipment or component is integral to that technology, it should be considered part of the ECES element cost.

Note: Users need to be careful to not duplicate or omit cost.

V. HOW THE SITES ARE USING THE STRUCTURE

ECES allows DOE/EM to standardize cost estimating & cost collection across the complex. Additionally, ECES serves as a checklist of activities to be conducted in a project and ECES can be applied for a variety of projects including restoration, D&D, waste management, and other environmental projects.

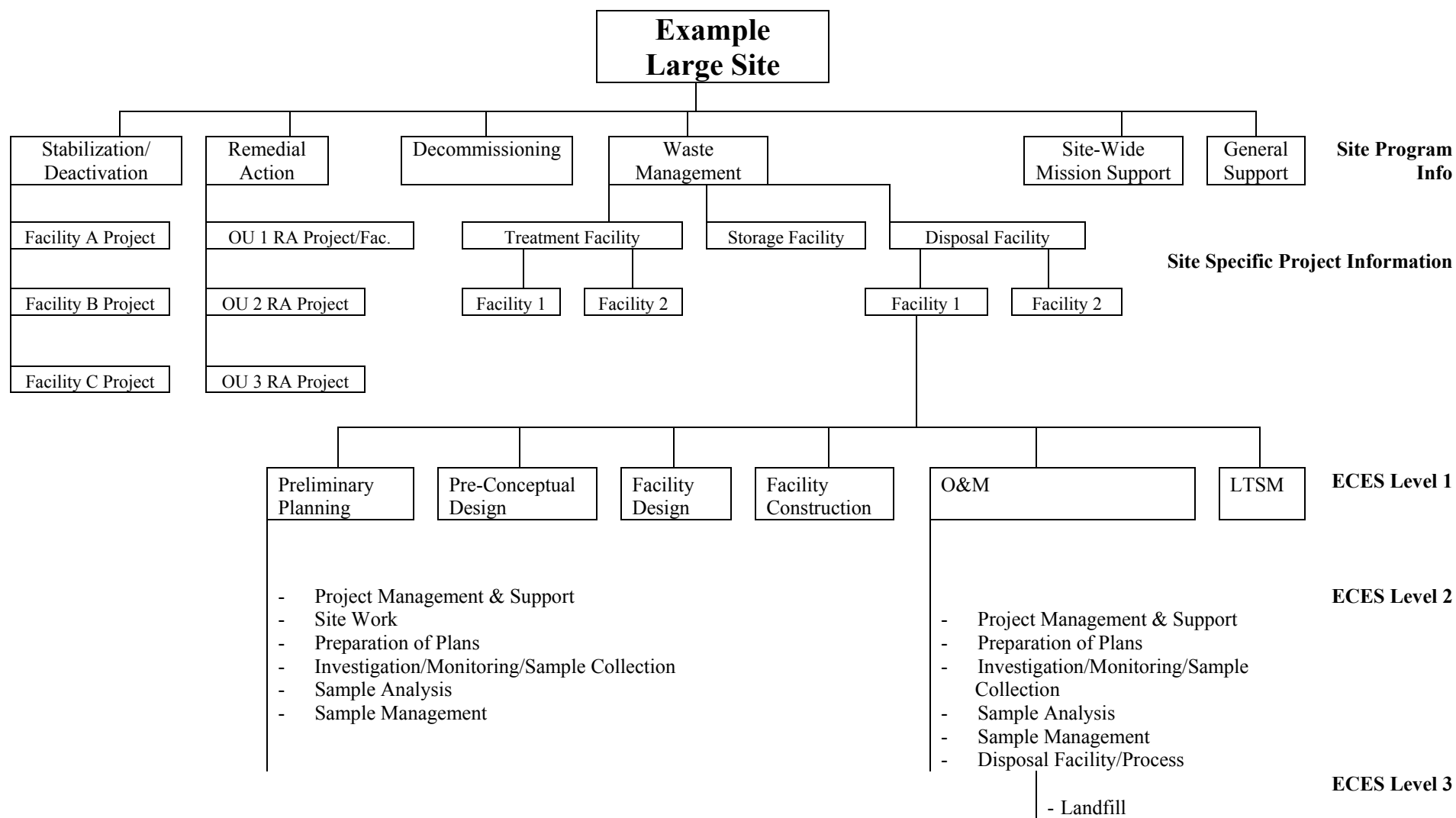
Richland and Savannah River Site ER Programs and Oak Ridge (OR) EM Programs have adopted the ECES element and the definitions as the basis for their COA. These sites use the ECES but have different numbering systems (to adjust to the site's existing accounting system).

5.1 Site Applications

The following pages shows how ECES is used in site specific COA and can be applied to various environmental projects or programs.

It should be noted that ECES is not used for high level program data, but used at the specific project level. The higher level program data such as site/facilities locations, waste types, funding types are captured above the ECES. Next two pages show examples of how program information are captured above the ECES and project level.

Figure 5.1 Sites Categorized by Location or Facilities, Regardless of Contaminants



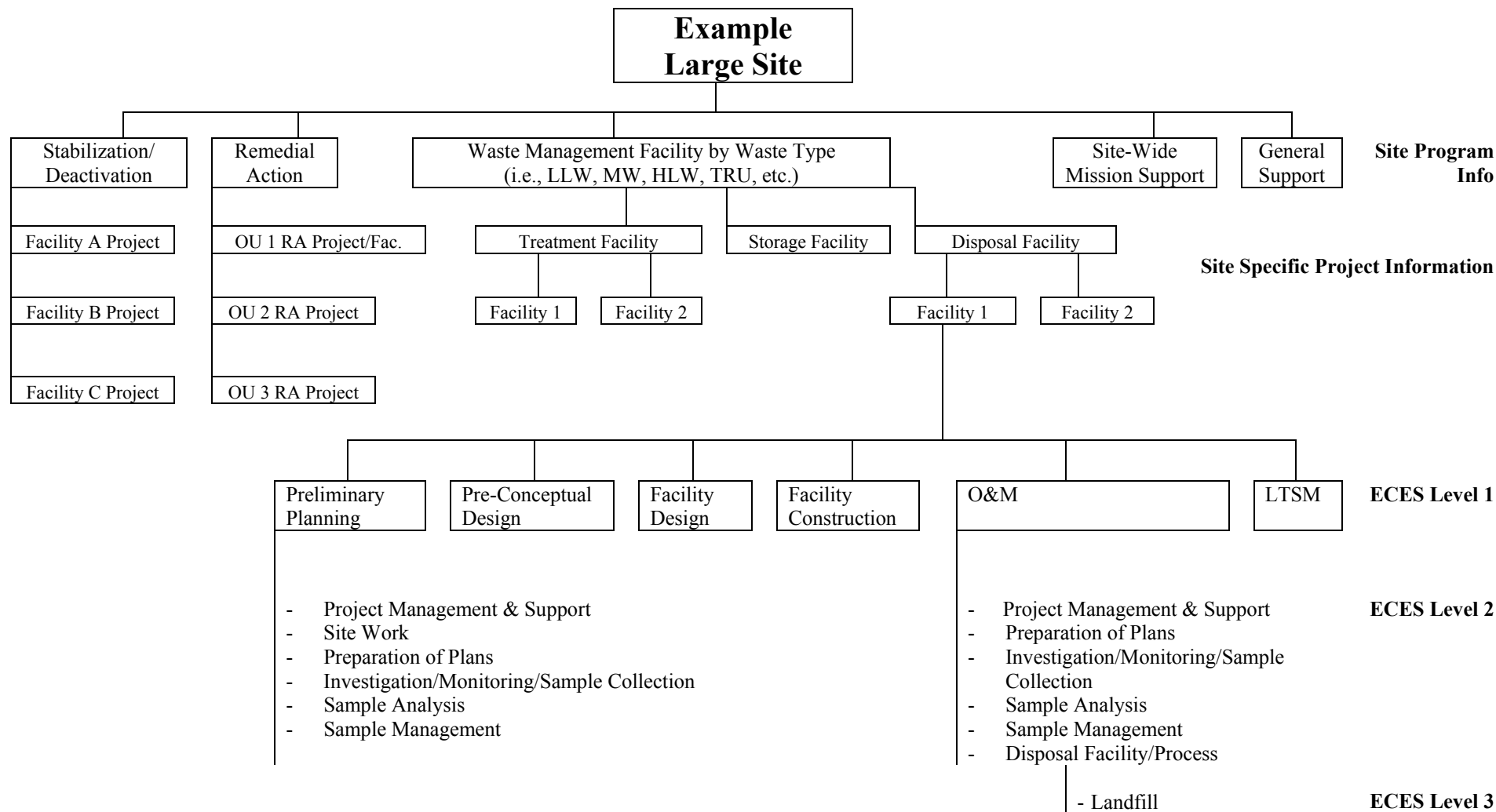
As shown in Figure 5.1, at some sites, the programs are categorized by location or facilities, regardless of contaminants. For instance, OU 1 RA Project, or the Disposal Facility may have contaminants that are considered mixed low level waste and low level waste.

In the figure, the site, program, and the facility type information are captured above the ECES. As an example, the O&M of Landfill facility may be designated as 1.WM.D1.5.13.04.

- 1. Site Designation (i.e., SRS, ID, ORO, etc.)
 - WM.** Program Designation(i.e., waste management, D&D, etc)
 - D1.** Project Info. (i.e., Disposal Facility 1 or location D1)
 - 5.** ECES Level 1 (Phase 5)
 - 13.** ECES Level 2 (Disposal Facilities)
 - 04.** ECES Level 3 (Landfill)

Also see Section V, Crosswalks and Boxology on how site data and ECES are used to capture cost.

Figure 5.2 Sites That Categorize Facilities by Waste Type



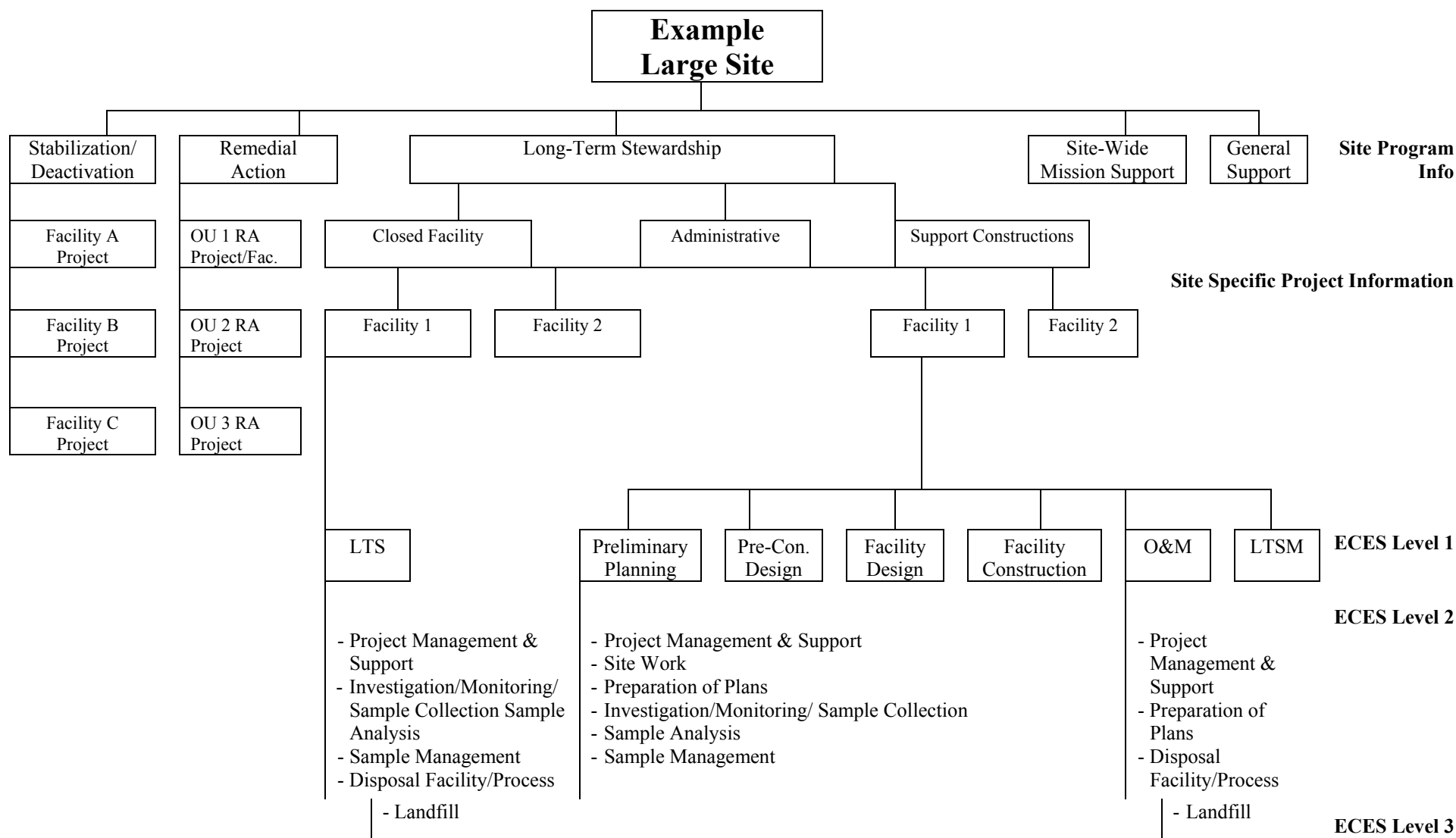
At some sites, especially waste manage, the programs are categorized by waste media or contaminant type instead of by facility or location. For instance, a treatment facility may be specifically constructed to treat high level waste (HLW).

For this case, the waste type will also be captured above the ECES since ECES is used below the project level. As an example, the O&M of a facility that only dispose of HLW such as Underground Vault facility may be designated as 1.WM. H.5.13.04.

- 1. Site Designation (i.e., SRS, ID, ORO, etc.)
 - WM. Program Designation(i.e., waste management, D&D, etc)
 - H. Waste Type Designation (i.e., HLW)
 - 5. ECES Level 1 (Phase 5)
 - 13. ECES Level 2 (Disposal Facilities)
 - 04. ECES Level 3 (Landfill)

Also see Section V, Crosswalks and Boxology on how site data and ECES are used to capture cost.

Figure 5.3 Relationship Between Various Programs and ECES



At some sites, or in the future, long-term stewardship (LTS) or other programs may exist concurrently. For those situations, the program types are captured above the ECES. For instance, a LTS program may be responsible for surveillance and inspection of closed facilities or may have to construct a road 10 years from now to get to the site. The above depicts how ECES is used in such situations. As an example, the LTSM or LTS of a closed facility 1.L. C.6.13.06.

- 1. Site Designation (i.e., SRS, ID, ORO, etc.)
 - L. Program Designation(i.e., LTS, ER, WM, etc)
 - C. Activity Type (i.e., Closed facility, records management, etc)
 - 6. ECES Level 1 (Phase 5)
 - 13. ECES Level 2 (Disposal Facilities)
 - 04. ECES Level 3 (Landfill)

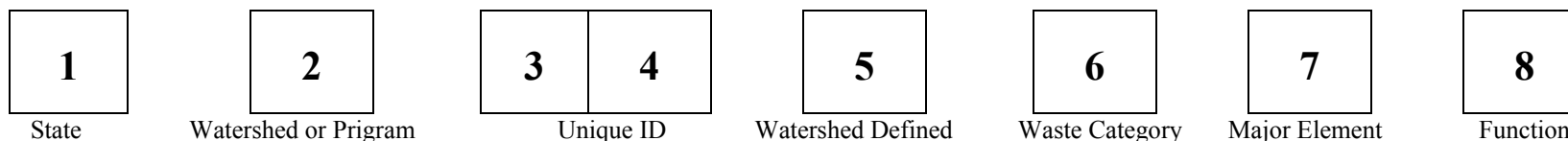
Also see Section V, Crosswalks and Boxology on how site data and ECES are used to capture cost.

5.2 *Cross-walking and Boxology*

Most sites' accounting systems have several characters or space available for identifying specific project items. These characters can be used to identify project location, regulation types, waste types or other information. Each box or space has a number, character or alphabet which represents something. For example:

A	2	3	4	5	6	7	8	9
----------	----------	----------	----------	----------	----------	----------	----------	----------

At Oak Ridge:



Character 1: <u>State</u>	Character 2: <u>Watershed/Program</u>
State identifier for Non-Capital K Tennessee (Oak Ridge) R Kentucky (Paducah) S Ohio (Portsmouth) N Non-State-Specific Z Other DOE Primes	Alpha code for direct (not distributed) work B Technology Development C Environmental Management Waste Management Facility (EMWMF) Disposal cell D Reindustrialization F Enrichment Facilities (EF) K ETTP L Legacy Waste M ORNL - Melton Valley P Other Bechtel Jacobs Company Direct Programs R Paducah S Portsmouth T ORNL - Bethel Valley U Y – 12 W Waste Ops X Work for Others Z Other DOE Primes
State identifier for Funded Capital Work A Tennessee (Oak Ridge) C Kentucky (Paducah) E Ohio (Portsmouth)	
State identifier for No Color Capital Work B Tennessee (Oak Ridge) D Kentucky (Paducah) F Ohio (Portsmouth)	

Characters 3 and 4: Unique Subproject ID

Character 5: Watershed Defined

Character to allow watersheds to segregate work areas or items (e.g., facility site for Oak Ridge Waste Operation). **For Legacy Waste Watershed projects, the following site designations apply when combined with major elements H – Waste Storage, J - Collection and Transport, M - Facility Closure and Y- Generator Services: 1- ORNL, 2-Y-12, and 3-ETTP.**

Character 6: Unique waste category

Character 7 and 8: ECES cross-walked element

At Richland ER Program Project COA is as follows:

<u>Job Number</u>						<u>Sub Number</u>			<u>Site Reference</u>						<u>Work operation</u>				

- Job number is the corporate wide reference number
- Sub number is the accounting reference number
- Site reference indicates location and organization codes
- Work operation number identifies the work performed, that is, it crosswalks to HTRW WBS/ECES

Example of Work Ops. No. - HTRW WBS/ECES

Work Op	Description	HTRW	ECES
6210	Groundwater Collection, Subsurface, Trench	33.06.02.10	X.18.03
85L0	Solids Collection, Cap, Paving Cover	33.08.05.20	X.19.9x
H210	D&D, Facility Shutdown, Facility Preparation	33.17.02.10	x.31.01.03

Note: Both alpha and numeric are used. Alphas are used to represent those numbers greater than 9.

5.3 Implementation

In implementing the ECES, a phased approach is used. The first step in the phased approach is to identify the current accounting system and its features. Second, the current site COA is cross-walked to ECES. Then training is provided to user of COA with new system. The final steps include the adoption of the new system as site COA with some projects, and the eventual adoption of the cost structure fully.

5.4 Contracting Language

Most effective method to implement ECES and ECAS is to incorporate the requirement language in contracts. This approach is/was used at OR Operations Office, the Navy, and Corps of Engineers. The following contains example of contracting languages that site can used to require contractors to use ECES

It is suggested that the following cost estimating and cost collection requirement language be incorporated in the environmental management work contracts and subcontracts. The suggested language provides a general format of the contract language, which can be modified to suit the type of contract and the work to be accomplished, by the contracting specialist in consultation with the project manager.

Suggested cost estimating requirement language in contracts:

To allow for the collection of meaningful historical costs and the development of tools to facilitate estimating throughout DOE and other government agencies, an interagency Environmental Cost Element Structure (ECES) has been developed. The contractor and subcontractors are advised to use this structure or any other similar national standard for environmental costs, to the maximum extent possible, for the development of estimates and capture of costs for environmental management work.

Within ____ days after the award of the contract, the contractor will submit to the contracting officer all estimated costs associated with the environmental management Scope of Work, in a work breakdown structure, which utilizes the Environmental Cost Element Structure (ECES) at level 3 of this structure or other level of detail if specified by the contracting Officer.

For contract work to be accomplished through work packages, task orders, subcontract, etc., the contractor shall submit to the Contracting Officer or his representative cost estimates for this work to level 3 of the ECES, or other level of detail if specified, before starting the work. The ECES is available on worldwide web network at <http://www.em.doe.gov/aceteam/index.html>. Since ECES may require some changes as it is in developing stage, the contractors and subcontractors shall use the most recent version at the time of developing the estimates.

Suggested cost reporting requirement language in contracts:

During the course of the contract, for all contract and subcontract work, the contractor will collect actual costs of work accomplished by them or subcontractors, and report the actual costs, along with any required secondary parameters or attributes, in a manner suitable for use with the historical cost collection systems employed by the contracting officer.

VI. USE OF APPENDIX AND OTHER MISCELLANEOUS ITEMS

With the ECES document, the Appendix contains very useful and important information. Also described briefly in this section is ECAS development and ECES updates.

6.1 Structure Cross-walks

To allow users the flexibility to utilize ECES or HTRW WBS, in the appendix, there is a crosswalk of the HTRW WBS to the ECES up to the third level. Also included is a crosswalk from ECES back to HTRW WBS.

6.2 Secondary Parameters

Secondary parameters are those essential parameters that impact the design and cost of alternatives and the secondary parameters matrix is included in the appendix. Following are some guidance on how to read the table. The top row of the matrix is the names of those parameters or measures. The first four columns indicate the ECES numbers and the ECES element names. The numbers marked within the matrix represents those ECES phases where these parameters are most applicable. The bolded numbers represent primary unit of measure. The numbers are used as a guideline, and users are free to mark as appropriate. For example,

ECES No. X.05.03, Clear and Grub is marked with the numbers 1-4 for Area and Type of Equipment. This means that the parameter Area is applicable for Phases 1 through 4 work. Additionally, because the numbers are bolded, Area is also considered primary unit of measure. The bold numbers 1 through 4 under Type of Equipment represent the applicability of this parameter to the ECES element

Lv	Lv	ENVIRONMENTAL COST ELEMENT STRUCTURE																	Descriptive Parameters					
2	3	Environmental Management	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36		
.05		SITE WORK																						
.05	.01	Mobilization	1-6			1-6									1-6	1-6								
.05	.02	Cleanup/Landscaping/Revegetation							1-6															
.05	.03	Clear and Grub							1-4							1-4								
.05	.04	Demolition		1-5					1-5	1-5					1-5	1-5								
.05	.05	Excavation and Earthwork		1-5					1-4							1-4	1-4							
.05	.06	Load and Haul				1-5			1-5								1-5							
.05	.07	Borrow Pit / Haul Roads		1-4		1-4			1-4	1-4								1-4						
.05	.08	Access Roads			1-4	1-4			1-4					5,6				1-4						
.05	.09	Arterial Roads/Divided Highways			1-4	1-4			1-4					5,6				1-6						
.05	.10	Diesel Generator												5,6	1-4					1-6				

Note: Below is a listing of parameters associated with the numbers in row two.

17. Sum

18. Depth/Vertical

19. Distance
20. Length
21. Width
22. Diameter
23. Area
24. Volume
25. Weight
26. Concentration In
27. Concentration Out
28. Rate
29. Number/Each
30. Type of Equipment
31. Physical State of Media
32. Materials Used
33. Special Condition/ Special Technology Parameters
34. Special Technology Requirements
35. Techniques or Technologies
36. Any Other Factors Effecting Cost

6.3 *ECAS*

While the ECES provides the foundation and structure for a standardized cost format and definition, there still must be a system to collect, analyze, maintain, and distribute this data. Environmental Cost Analysis System (ECAS) is being developed to accomplish this task. ECAS is a database and an analysis tool that will assist DOE in better understanding those parameters that impact EM project costs.

Additionally, ECAS will perform searches, and readily provide reports and data needed for future estimating, project planning, and benchmarking. ECAS will be used with ECES to better establish a consistent and standardized system that will provide the ability to compare estimates/costs with other projects and programs across DOE complex

6.4 *Updating the ECES*

As new technologies are developed and as work elements change, ECES will need to be updated. Agencies or other organizations can propose additional elements for modification to the ECES by submitting suggested revisions directly to the agency or through the web at <http://www.em.doe.gov/aceteam>. (EC)² will conduct review of recommendation and update the ECES annually.

REFERENCE

1. Advancement for Association of Cost Engineers, *Skills and Knowledge of Cost Engineering, Third Edition*, 1993, Morgantown, WV.
2. Department of Energy, Environmental Management Applied Cost Engineering Team, *Practical Cost Estimating and Validation Lessons-Learned Workshop*, 1998.
3. Department of Energy, *Cost Estimating Guide*, 1998, Washington, DC.